

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
3 March 2005 (03.03.2005)

PCT

(10) International Publication Number  
**WO 2005/019364 A1**

(51) International Patent Classification<sup>7</sup>: **C09G 1/02**

(74) Agents: HAYDEN, Christopher, G. et al.; Morgan, Lewis & Bockius LLP, 1111 Pennsylvania Avenue, NW, Washington, DC 20004 (US).

(21) International Application Number:  
PCT/US2004/025913

(22) International Filing Date: 12 August 2004 (12.08.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/494,954 14 August 2003 (14.08.2003) US  
60/494,955 14 August 2003 (14.08.2003) US

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(71) Applicant (for all designated States except US): EKC TECHNOLOGY, INC. [US/US]; 2520 Barrington Court, Hayward, CA 94545 (US).

(72) Inventors; and

(75) Inventors/Applicants (for US only): SMALL, Robert, J. [US/US]; 5198 S. Civano Boulevard, Tucson, AZ 85747 (US). NOJO, Haruki [JP/JP]; 440, Kurami, Samukawa Machi, Koisa-gun, Kanagawa-Ken 253-0101 (JP). ORUI, Kenichi [JP/JP]; 105, Asahi Heights, 5-40-14, Asahi-cho, Atsugi-shi 243-0014 (JP). ARAGAKI, Steve, Masami [JP/JP]; 905, Kawasaki Ober, 2-8, Minami Saiwai-cho, Minami Saiwai-ku, Kawasaki-shi 212-0016 (JP). HAYASHIDA, Atsushi [JP/JP]; 201, Casa Noji, 34-5, Shiratoridai, Aoba-ku, Yokohama-shi 227-0054 (JP).

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: PERIODIC ACID COMPOSITIONS FOR POLISHING RUTHENIUM/HIGH K SUBSTRATES

(57) Abstract: A method of polishing a semiconductor substrate surface having at least one ruthenium feature thereon and at least one dielectric material, wherein the substrate is contacted with an aqueous composition containing from about 0.0005 to about 1 moles / kilogram of periodic acid, from about 0.2% to about 6% % by weight of silica abrasive having an average particle size of about 50 nm or less, and an amine in an amount sufficient to adjust the pH of the composition to between about 2.5 and 7. The removal selectivity of the ruthenium to a low-K dielectric is greater than 20:1. Advantageously, the substrate further has a tantalum-containing compound, and the polishing rate of the tantalum-containing compound is about the same as the polishing rate of the ruthenium, so that the polishing process is a one-step process.



WO 2005/019364 A1